SCIENCE

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CURRENT NOTES ON CHEMISTRY.—III.

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British Association, Nottingham Meeting.

The International Scientific Congresses recently held in Chicago have attracted world-wide attention and have rightly been accepted as *the* feature of our great "Fair." But other meetings have also been held this summer, several of rather more than usual interest. At the meeting of the Iron and Steel Institute many valuable papers were presented, and more recently the meeting of the British Association for the Advancement of Science was opened at Nottingham, September 13. For some years past and for no well-founded reason, the meetings of the British Association have been but lightly attended by the pure scientists, but this present year, largely through the labors of Prof. Emerson Reynolds, M. D., Sc. D., F. R. S., President of the Chemical Section, Section B., a larger attendance was secured and a superior programme obtained. An attractive feature was the lecture by M. Moissan, on the preparation and properties of the element fluorine, together with exhibitions and demonstrations of his progress in chemistry and high temperatures.

Professor Reynolds's opening address before Sec. B. is an epitomized review of the work done during the past year, with special attention to certain features of advance made in our knowledge of chemical theory. Reference is made to the methods of inquiry and study in medicine, and while vast progress is shown during the past twenty-five years, the present state of the chemical branch of this instruction is deplored as leading to a knowledge of substances rather than of principles, of products, instead of the broad characters of the chemical changes in which they are formed. Without this higher class of instruction it is unreasonable to expect an intelligent perception of complex physiological and pathological processes which are chemical in character, or much real appreciation of modern pharmacological research.

A side light is being thrown on the nature of the elements by the chemico-physical discussion between Armstrong and Hartly as to the connection existing in the constitution of certain organic compounds and the colors they exhibit. We may take it as an established fact that a relation exists; and, if so, then why may not elements of distinct and characteristic color be considered as complexes analogous to definitely decomposable substances? The two elements, nickel and cobalt, of decided color in their salts and in their metallic plates, add strength to this idea in that they may be considered as exhibiting a sort of isomerism. Their atomic weights are the same within limits of experimental error; and, by analogy with compounds, identity of atomic weight implies dissimilarity in constitution and therefore definite structure.

The genesis of chemical elements is now being studied with the application of the principles of gravitation. Mendeleef, in 1889, first proposed to apply Newton's Third Law, and now Rev. Dr. Houghton in recently published papers applies the three Newtonian laws to explain the interactions of chemical molecules, with this difference only, that atoms have a specific coefficient of attraction varying with the nature of the atom concerned, whereas the specific coefficient of gravity is the same for all bodies independent of their composition or matter.

The remainder of Dr. Emerson's paper is devoted to a sketch of comparative chemistry, of great interest but rather difficult of condensation. Silicon is considered as an analogue of carbon. Nitrogen compounds of silicon are prepared and described, but it is shown that the combination is not a natural one and that, as silicon dissolves freely in molten aluminum, so in nature it is with aluminum that it most readily combines. Aluminum may then be considered, in this respect at least, as analogous to nitrogen. The natural alumino-silicates are, according to this standpoint, products of the final oxidation of sometime active silico-aluminum, analogues of carbo-nitrogen compounds rather than ordinary double salts. The alumino-silicates of the primary rocks are thus oxidized representatives of substances which foreshadowed in terms of silicon, aluminum and oxygen, the compounds of carbon, nitrogen and hydrogen required at a later date of the earth's history for living organisms.

Production of Pure Oxygen From Air and Furnace Gases.

A number of processes for the manufacture of pure oxygen from air have appeared recently, all following in a general way the suggestions of the well-known "Brin" process. Herr G. Kassner in the *Chemiker Zeitung*, claims a superiority for a salt of calcium, the calcium plumbate, Ca_2PbO_4, his process being briefly as follows: The plumbate in spongy porous pieces is exposed to the action of moist furnace gases which have previously been well washed. Carbonic acid is absorbed by the calcium salt with decomposition, forming calcium carbonate and free peroxide of lead. This decomposition is unaccompanied by a change of form. The resulting mass is transferred to a strong retort heated to redness. Oxygen is disengaged and the evolution facilitated by a stream of superheated steam. Finally carbonic acid is given off and in the last stages this is pure. In the intermediate stage the gases are passed over calcium plumbate and the carbonic acid there absorbed leaving the oxygen pure. Another similar process has been patented by Peitz, calling for the use of pure carbonic acid.

Le Chatelier proposes a direct method of heating to drive off the oxygen and a reabsorption of the oxygen from the air, but Kassner, who has already experimented with the direct method, considers the higher temperature, the larger expenditure for fuel necessary, and the consequent greater wear upon the retorts, serious obstacles successfully overcome only by his later indirect method.

Mr. L. Chapman, London, has patented a process depending upon the alternate oxidation and reduction of a mixture of manganese dioxide ("or a similar substance") with caustic soda by means of air and steam respectively. Finely divided manganese dioxide and caustic soda in the proportions necessary to the formation of the manganate are mixed with a weight of sodium sulphate equal to the weight of caustic soda taken. Air is passed through small pipes leading nearly to the bottom of the vessel,

thus assuring mixture and oxidation by the uprising current. When the oxidation is complete the air is shut off and the air in the upper parts and in the supply and exit pipes removed by means of steam. Dry steam is then passed. Nitrogen is obtained with a slight modification, by collecting the gas which escapes during the oxidation and again passing it through the mixture.

ELECTRO DEPOSITION OF IRIDIUM.

AT the Madison meeting of the American Association, Dr. Wm. L Dudley described his method for maintaining a constant metallic strength and purity in an electrolytic bath for the deposition of iridium. The electrolytic solution of the metal from an anode was of course desirable, but was found to be a tedious and expensive process. Success was finally attained by the use of (1) an oxide, or (2) a hydroxide, these to be insoluble in the electrolyte but freely soluble in the acid radicle set free at the anode. Iridium hydrate, $Ir(OH)_4$, was employed suspended in loose-fitting linen bags between the carbon anodes. Sodium iridichloride and ammonium iridichloride gave satisfaction as did also a solution of the hydrate in sulphuric acid with the addition of ammonium sulphate.

Dr. Wm. H. Wahl had evolved the same process for the platinum group after much independent study parallel with that of Dr. Dudley.

COMMERCIAL ORGANIC COMPOUNDS BY ELECTROLYSIS.

THE production of commercial organic compounds by electrolysis is a significant step in the advancement of electrolytic methods. F. Bayer & Co., of Elberfeld, are now producing the periodides of the phenols and the phenolcarboxylic acids by subjecting mixtures of solutions of the alkaline salts of phenols and of alkaline iodides to the action of the electrical current. A solution of the alkaline iodide is prepared and in this are immersed the electrodes separated by a diaphragm. The current is passed and at the same time an alkaline solution of phenol is gradually added. Two amperes per square decimetre of electrode surface is sufficient. In a few hours the phenol becomes entirely converted to the periodide, which separates out in solid form.

The electrolysis of a solution of ferrous sulphate to which a weak solution of proto-chloride of iron, sodium, potassium, calcium, vanadium or magnesium has been added produces a basic sulphate of the peroxide. Adding the equivalent of sulphuric acid before or after electrolysis forms the tri-sulphate of the peroxide of iron which is used in the preparation of dried blood manure.

MM. Hermite and Dubosc cause ferrous sulphate to circulate in an electrolytic apparatus, arranged to maintain a maximum amount of the salt in solution, and so obtain a saturated solution of the sulphate of the peroxide. By varying the current in density and duration more or less of this salt may be formed, constituting the various mordants known as "rust," "sulpho-nitrate" and "persulphate of iron." The apparatus consists of an enameled iron tank with an outlet for draining at the bottom, a perforated pipe in the lower part for supplying the solution, and an overflow at the top. The electrodes are plates of iron and thin sheets of platinum.

DETERMINATION OF IRON AND SILICON IN COMMERCIAL ALUMINUM.

DR. A. ROESSEL gives the following process for the determination of iron and silicon in commercial aluminum. Three to four grammes of the metal are gradually introduced into 35 cc. of hot potash lye (30–40 per cent). The metal dissolves leaving a black floculent residue. The solution is now supersaturated with pure hydrochloric acid in a platinum crucible without previous filtration, and is then evaporated to dryness. The mass is moistened with hydrochloric and the silica is determined in the ordinary way. For the determination of the iron, Roessel dissolves 3–5 grammes of aluminum as before and mixes with an excess of dilute sulphuric acid. The solution is heated until clear and is then titrated with potassium permanganate. The potash-lye used must, of course, be tested for silica.

NOTES AND NEWS.

THE AMERICAN BOOK COMPANY have issued several books for the study of classics, some of them new, and some merely new editions. Of the latter class are "Arnold's First and Second Latin Book" in one volume and "Arnold's Latin Prose Composition." These works, which have been in use for many years, have been revised by James E. Mulholland; the revision being confined to the correction of errors and a few minor additions, without changing the essential character of the original works. The two other classical books that lie before us belong to the series of which President Harper, of the University of Chicago, is one of the editors. In editing "The Aeneid (six books) and Bucolics of Vergil" Mr. Harper has been assisted by Frank J. Miller, instructor in Latin in the same university; and the edition they have prepared differs in some respects from most of those now in use. An important feature of the work is the series of "Inductive Studies," mostly grammatical, which precede the poem itself, and in connection with the notes and the vocabulary, are designed to give the student his grammar, notes and lexicon all in one volume. The book also contains twelve full-page illustrations, being reproductions of noted works of art. The other volume in the same series is an edition of the whole of "Xenophon's Anabasis," prepared by President Harper and James Wallace of Macalister College. This also contains inductive exercises and other grammatical helps, together with notes and a vocabulary. There is also an introduction showing the historical setting of the Anabasis, with a description of the Greek and the Persian modes of warfare and many pictorial illustrations of warlike material and other appurtenances of ancient life. These books are well printed and substantially bound.

—The Minnesota Academy of Natural Sciences, in conjunction with the St. Paul Academy of Sciences, made an excursion on Sept. 16 to Taylor's Falls, on the St. Croix River. The party numbered eighty persons. The sandstones overlying the Cambrian igneous rocks through which the St. Croix River passes, forming a beautiful erosion gorge and the bowlder conglomerate formed of the broken down igneous rock were inspected. The early age of the conglomerate is demonstrated by the presence in it and in the cementing sand of fossils of certain date. Pot-holes of great size are seen there, one into which access is possible holds more than twenty persons at one time.

—Messrs. Macmillan & Co. announce a second edition of Professor Goldwin Smith's brilliant sketch of the United States, the first edition of which was exhausted in two weeks. Written by an Englishman who regards the American commonwealth as "the greatest achievement of his race," this book must possess a peculiar interest for American readers.

—M. L. Holbrook, New York, will publish early in the Autumn another book by Bertha Meyer, author of "From the Cradle to the School," entitled, "The Child, Physically and Mentally; Advice of a Mother according to the Teaching and Experience of Hygienic Science; a Guide for Mothers and Educators." It has been translated by Friederike Salomon, revised by A. R. Aldrich.